(P1-3)

Powder X-ray diffraction study of $SmOs_4Sb_{12}$

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The filled skutterudite $SmOs_4Sb_{12}$ is an unconventional heavy-fermion (HF) compound. The interesting point is that the electronic specific-heat coefficient γ is about 800 mJ/K^{2}mol and this γ value does not show significant decrease by apllying magnetic field[1]. The origin of the HF state is controversial. Recently, M. Mizumaki *et al.* revealed the temperature dependence of the valence of Sm ion [2]. The valence of Sm ion is 2.83+ at room temperature, gradually decreases below 150K with decreasing temperature, and becomes to be 2.76+ below $T^* = 28$K. In order to investigate the structural change associated with the valence of Sm ion, we have carried out powder X-ray diffraction.

The experiment was done at the beamline BL02B2 in SPring-8. The incident X-ray energy was tuned to be 15keV. We measured the powder diffraction patterns below room temperatures to 10K. The powder diffraction patterns were analyzed with the Rietveld method by using the software RIETAN-2000 [3].

Figure 1 (a) shows the temperature dependence of the lattice parameter a for $SmOs_4Sb_{12}$. With decresing temperature, the lattice parameter increases between 200K and 150K and decreases below 150K. The lattice parameter is compared with that of $PrOs_4Sb_{12}$. For $PrOs_4Sb_{12}$, the valence of Pr ion is 3+ in the whole temperature region and the lattice parameter monotonously decreases with decreaseing temperature [4]. As shown in fig. 1 (b), the lattice obviously swells below 150 K in $SmOs_4Sb_{12}$. This anomaly consists well with the change in the valence of Sm ion. The profile in the diffraction patterns show no symmetric change in our resolution. These results suggest that it has possibility of the change with the atomic positions and/or the thermal atomic displacement parameters. More detailed analyses are in progress.

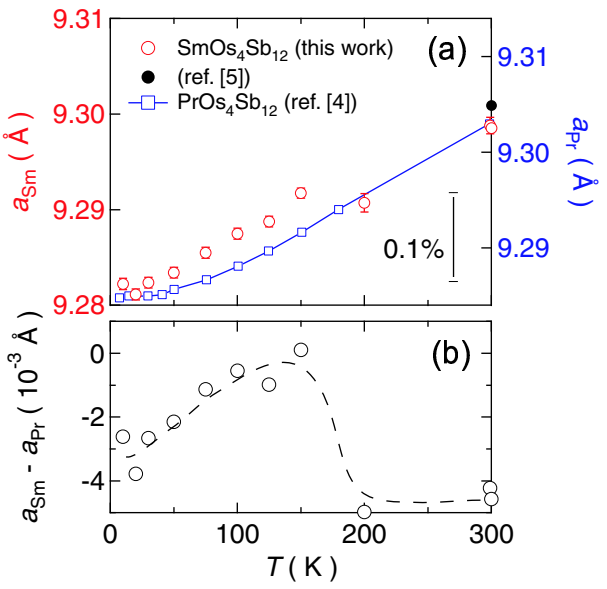

Figure 1: Temperature dependence of lattice constant a for $SmOs_4Sb_{12}$.

References

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